

# TROUBLE IN PARADISE

Reputed for pristine tranquility—miles of white sand and palm trees, ocean stretching as far as the eye can see with warm tropical breezes lightly blowing over the waves—the Pacific Islands represent the antithesis of and the antidote to the world's crowded, polluted, industrial cities and suburbs. However, the Pacific Islands are undergoing dramatic changes that may lead to irrevocable transformation in the next few years. Already, forces such as population growth, the world economy, and westernization are leading the Pacific Islands away from their idyllic origins and rapidly into the 21st century. At the same time, a legacy of exploitation by foreign powers has already left an indelible mark on the land, water, and people of the Pacific Islands.

The Pacific Islands are distinguished by placing last in many important trends and events. They were the last major region of

the earth to be populated by humans, the last to be explored and colonized by Europeans, the last to be westernized, and the last to achieve self-government. The protection that remoteness confers has been both a blessing and a curse, rendering these islands' ecologies both exotic and precarious at the same time.

Since the early 16th century, when Magellan first circumnavigated the globe, the introduction of both foreign species and unfamiliar diseases has vastly changed the flora and fauna of the Pacific Islands, particularly on those islands that have received more Western visitors. For example, venereal disease has had a disastrous impact on islanders' health, and the introduction of Western consumer culture continues to present problems for the people of the Pacific Islands.

Currently, there are still numerous and strong foreign political influences active in

the Pacific Islands. U.S. holdings in the Pacific Basin consist of three territories (American Samoa, Guam, and the Commonwealth of the Northern Marianas Islands) and three self-governing freely associated states (the Federated States of Micronesia, Palau, and the Republic of the Marshall Islands). France retains territorial rights in French Polynesia and New Caledonia. Tokelau, a three-island atoll nation, has retained its ties with New Zealand, and the Pitcairn Islands remain a British colony.

Health indicators range widely in the Pacific Islands, from Hawaii, where average life expectancy is 72 years, to Papua New Guinea, where life expectancy is only 49.6 years and infant mortality is 72 per 1,000 live births. High infant mortality is also found in Palau (31.3), the Marshall Islands (55.2), the Federated States of Micronesia (52), and Kiribati (65).

More-developed Pacific Island nations do not necessarily have the highest immunization rates, however. A 1994 U.S. Public Health Report, titled *The Health Predicament of the U.S.-associated Pacific Islands: What Role for Primary Care?*, shows that while American Samoa's immunization rate for 2-year-olds is 61% and Guam's rate is only 39.7%, the less-developed Palau's immunization rate is 92.4%.

## Water, Water Everywhere . . .

Some 30,000 islands—more than half the world's total—dot the Pacific Ocean, with a collective land mass of some 1.6 million square km, or about 0.25% of the ocean's surface area. The Pacific Islands can be classified into two main types. High islands are volcanoes, either active or extinct, and are often ringed with extensive coral reefs. Low islands are circular or semi-circular reefs that are thought to have encircled volcanoes that have since submerged. These coral reefs have kept pace with rising seas over the millennia, and in some cases may be 1,400 m thick.

For geological, climatological, and cultural reasons, maintaining adequate supplies of potable drinking water can be a difficult undertaking on many Pacific islands. Nancy Convard, an environmental specialist at Howard Engineers of Hawaii in Honolulu and formerly an environmental health official in the Republic of Palau, surveyed land-based pollutants in the Pacific Islands in 1990, and found that in some rural areas of Papua New Guinea only 10% of the population had access to clean drinking water. "I think that, if anything, the situation has gotten worse over the past few years," says Convard. "Environmental issues in the islands continue to focus around sanitation."

Because of differences in density between fresh and salt water, the islands retain a reservoir of fresh water that is kept close to the surface of the ground by the pressure of salt water. Both high and low islands depend on rainfall to replenish fresh drinking water supplies. However, because mountainous high islands like Hawaii exert a cooling effect on clouds, they frequently have greater rainfall. High islands, with their greater land mass and richer volcanic soil, may also be capable of storing more water than low islands.

Agriculture, more common on high islands, has been singled out as a source of pollution. Pat Tummons, editor of *Environment Hawaii*, an environmental newsletter published in Honolulu, points out that chemicals used in pineapple cultivation such as dibromochloropropane (DBCP), ethylene dibromide (EDB), and

atrazine have been detected in drinking water on several of Hawaii's islands. Although none of these chemicals have been conclusively linked to adverse health effects, Tummons believes that it points out the vulnerability of small islands with limited water resources to drinking water contamination. "Another problem," Tummons says, "is that we have such a small population that it's difficult to do studies that would have any epidemiological merit."

Low islands, or atolls, are frequently only a few feet above sea level. Fresh water can be easily reached, often by drilling no more than three or four feet into the soil. While convenient, the proximity of water supplies to the surface places them at risk of contamination. Philip Moravcik, a technology transfer specialist at the University of Hawaii Water Resources Center in Honolulu, points out that pit toilets—sources of *E. coli* and other harmful bacteria—are still common on both developed and undeveloped islands, and are all too frequently adjacent to drinking water sources.

"Everything goes on [near the water]," says Moravcik, who recently worked in Chuuk, one of the Federated States of Micronesia. "There are pigs all over, chickens all over, little garden plots, and pig sties. . . . The rain water from catchment tanks is very good and very clean, but I've encountered situations where people would put city pipe water [which may not be potable] in catchment tanks, thereby contaminating the whole tank."

Frequent hurricanes and monsoons may also flood toilets and drinking water supplies and damage facilities for collecting rainwater, leading to contamination. Fluctuations in water supply may also be a factor in local outbreaks of diseases such as cholera, dengue fever, and malaria. These diseases can be serious problems in the Pacific Islands. Epidemics of dengue fever, spread by mosquitoes, occur periodically throughout most of the Pacific Islands. In 1990, the reported prevalence of malaria in the Solomon Islands was 372 per 1,000 inhabitants, several times higher than any other country in the region. According to a recent World Health Organization (WHO) study, *Health and Environment in Sustainable Development: Five Years after the Earth Summit*, "Honiara, the capital of the Solomon Islands, has had the dubious title of 'Malaria Capital of the Pacific.'" During 1992, the report states, the number of reported cases of malaria there exceeded the total population. In 1995 the city joined forces with the WHO Malaria Control Program to mount an intensive

effort to reduce malaria to a point where it would no longer be a burden. A package of targeted control measures was put into place that covered the entire population of 65,000: diagnosis and treatment facilities were upgraded to provide better treatment of malaria cases; insecticide-treated beds were distributed to every household with a special program to provide mosquito nets to pregnant women and infants; and measures to control mosquitos including spraying houses with chemicals and environmental measures to eliminate breeding sites were put into place. These measures were accompanied by an intensive program of community education that increased awareness of what could be done to control malaria. This program reportedly reduced rates of malaria infection in the Solomon Islands in 1996 by 78%, but Steve Tamplin, a WHO regional health adviser in environmental health, says it's too early to tell precisely which interventions were responsible for the drop.

## Climate and Health

Mike Hamnett, acting director of the Social Sciences Research Institute at the University of Hawaii, believes that fluctuations in rainfall from so-called El Niño Southern Oscillation (ENSO) events may play an important role in water- and mosquito-borne diseases. El Niño is a current of warm, relatively nutrient-poor water that runs down the western coast of South America, past Ecuador and Peru. Some years, the current runs farther south than usual, causing a variety of changes in associated weather, currents, and fishing patterns. Hamnett is hoping to compare his information with health data to see how reportable diseases correlate with ENSO occurrences. "When the [Southern Oscillation] is extreme," says Hamnett, "some islands that are normally wet get drier. We think that this might be associated with outbreaks of cholera, because there will be less rainwater available and people will turn to well water. At the same time, some very dry islands get wetter, and this may be associated with mosquito-borne diseases like malaria and dengue fever. This could be an interesting study of how human pathogens bloom under certain climatic conditions."

Simon Hales, a research fellow in epidemiology at the University of Otago in New Zealand, says that his work has already uncovered a relationship between the ENSO phenomena and dengue fever in Fiji. "They have an epidemic there every few years," he says, "and over the last 20 [years], they seem to have occurred in El Niño years."



**III winds.** Climatic events such as hurricanes and monsoons often affect Pacific Islanders' health by spreading disease.

Although short-term climatic variations often attract attention, many Pacific Islanders are more concerned about the long-term threat of global warming. Various researchers have predicted global sea level rises of 40–60 cm over the next 100 years. Atoll nations, whose islands are only a few feet above sea level, are concerned about the possibility of their entire habitat sinking below the ocean's surface.

As a 1996 WHO study, *Climate Change and Human Health*, points out, the average elevation of the Marshall Islands is less than 2.4 m above sea level. According to the study, protecting Majuro Atoll from a 30-cm rise in sea level would cost 1.5–3 times the entire nation's gross national product. A 1-m rise in sea level would inundate 10% of the homes on Tongatapu Island, where 67,000 residents of Tonga live.

In addition to flooding, sea level rise has the potential to affect a variety of health factors, including agriculture, fishing, availability of fresh water, contamination of fresh water due to disruption of sanitation, overall economic decline, and health effects due to population displacement.

### Cancer: Past, Present, and Future

To the people of the Pacific Island region, the era of nuclear arms testing is very memorable history. Many people living today recall the power and destruction of the atomic bomb along with the lasting health effects of radioactive fallout created by test explosions conducted by the U.S. government near Bikini and Eniwetok atolls in the 1940s and 1950s. Inhabitants of the French Polynesian islands have similar stories to tell of testing on their islands. Continued, large-scale U.S. government health assistance to affiliated nations in the Pacific Islands attests to the continuing problems these tests have caused.

Sixty-six atmospheric nuclear tests were conducted in the Marshall Islands when the area was still a United Nations Strategic Trust Territory. The most harmful of these tests was probably the 1 March 1954 "Bravo" test. Although weapons engineers predicted the explosion would be on the order of 5 megatons, it actually measured closer to 15. In addition, prevailing winds that would have carried the fallout to unpopulated ocean spaces shifted towards the eastern Marshall Islands. Researchers believed the fallout would travel no more than 15 miles (although the U.S. Navy moved its ships 50 miles out to sea as a precaution); instead, it traveled between 120 and 200 miles, where it rained down on the inhabitants of Bikini, Eniwetok, Rongelap, and Utirik. Several islands were contaminated with radioactive fallout.

Following the test, the U.S. Department of Energy identified 253 Marshallese who were deemed adversely affected by the blast. The U.S. government continues to follow Marshallese exposed to significant fallout, and to provide some health services to other residents of the area. High rates of thyroid disease and thyroid cancers, potentially related to radioactive fallout, have been observed in this population. A 1986 survey of Marshall Islands residents by Thomas E. Hamilton, published in the 7 August 1987 issue of *JAMA*, showed a high rate of thyroid nodules in the population, although their correlation with disease is not clear.

Although officials are considering the suitability of Bikini Atoll for rehabilitation, cancer continues to be a significant problem in the Pacific Islands. While complete figures are hard to compile, a 1997 Congressional Forum on Cancer Crises among Asian and Pacific Islanders, chaired by Congresswoman Patsy Mink (D-Hawaii), highlighted some alarming trends. Hawaiian men have the highest death

rates in the United States of non-Hodgkin's lymphoma, and share the highest mortality rates for leukemia as well as cancers of the lung and pancreas. Hawaiian women have the highest mortality rate in the United States of uterine cancer, and share the highest mortality rates for cancers of the breast, ovary, and pancreas. A 1995 study showed that from 1980 to 1993, the increase in the absolute number of cancer deaths among Asian and Pacific Islanders was twice that of all other racial/ethnic groups. Cancer, not heart disease, is the leading cause of death among females in this group. According to the American Cancer Society, death rates due to cancer for people of native Hawaiian descent are 1.9 times higher than for all other races in the United States, and death rates for those of pure Hawaiian descent are 3.2 times higher than for all other races.

Neal Palafox, associate professor of family practice at the University of Hawaii in Honolulu and an advocate for Pacific Islander health, points out that the rate of hepatitis B, a risk factor for liver cancer, is approximately 30 times higher in the Marshall Islands than in the mainland United States. In women of the Marshall Islands, cervical cancer mortality is 60 times greater than in the mainland United States, breast cancer and gastrointestinal cancers are 5 times greater, and lung cancer is 3 times greater. Among men, the lung cancer mortality rate is nearly 4-fold greater than that of overall U.S. rates, while oral cancer rates are 10-fold greater.

Palafox believes that the health infrastructure in the islands does not adequately address the geographical and cultural barriers present in island communities where, for example, people may live in poverty, separated from health care facilities by



**The bare necessities.** Primitive housing and sanitation conditions contribute to the spread of bacterial diseases.

thousands of miles of open water. "We cannot keep delivering the kinds of [cancer] screening services that don't reach high-risk populations," Palafox says.

Although the cancer figures sound dire enough, some health advocates believe that these figures obscure cancer rates for Pacific Islanders that are even more alarming. JoAnn Tsark, director of research, education, and training for the Rehabilitation Hospital of the Pacific in Honolulu, says, "At the National Cancer Institute [NCI], native Hawaiian and Pacific Islander cancer data are consistently aggregated within the 'Asian and Pacific Islander' rubric, masking the high death rates among Hawaiians and rendering NCI reports misleading and harmful. It gives us no leverage for resources and renders us invisible in the policy-making process."

Although debate continues about the extent of cancer risk caused by nuclear testing, the Marshall Islands' government has reportedly studied the feasibility of storing nuclear waste in the area. Senator Daniel Akaka (D-Hawaii) has spoken in opposition to the proposed sites at Wototo and Erikub atolls, which are to the west of Hawaii. Citing the Insular Area Appropriation Act of 1980, which prohibits storage of nuclear waste in the United States' territories or possessions without an act of Congress, the Hawaiian House of Representatives passed a resolution to oppose nuclear waste storage in the region.

## A Rapidly Growing Region

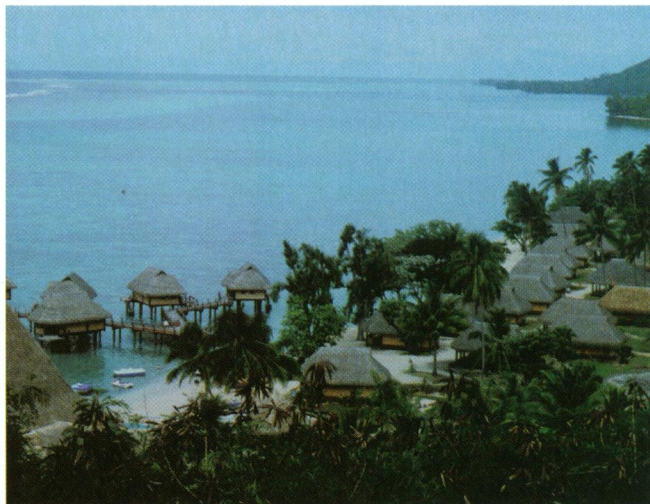
From the early 16th century, European intrusion into Pacific societies has had disastrous health consequences. In the 1500s, Spanish *conquistadores* brought infection and venereal disease to the Pacific's native peoples. Today, a number of diseases associated with urbanization, modernization, and westernization have taken hold in the Pacific Islands. Growing populations strain the resources of many small islands, and new dietary and lifestyle patterns have had widespread deleterious effects on health.

Island populations that were devastated by war and disease in World War II have since begun to increase. For years, the population of American Samoa was relatively stable at about 35,000. Today, however, because many Samoan retirees who had worked in Hawaii are moving back to their home island, the population may rise as high as 50,000 by the end of the century. "On an island of about 77 square miles, most of which is mountainous, that's close to a concentration of 1,000 people per habitable square mile," says Peter Rappa, a resource management agent of the Univer-

sity of Hawaii Sea Grant Extension Service. "In the Marshall Islands, the population has more than doubled since 1980, with half the residents under the age of 20. The baby boom [the West] went through is just starting in the Pacific Islands, and it's going to be hard to find room to accommodate everyone."

As these populations grow, Rappa points out, islanders tend to migrate to larger cities and island capitals. Fewer islands are capable of supporting their populations on the traditional subsistence fishing and farming of pigs, yams, and taro root. As economies become westernized, diets have become richer in calories and fats, and the Pacific Islands have a serious and growing problem with diabetes and heart disease as a result. In her 1995 review of Pacific Island health, *In a Sea of Change: Health Transitions in the Pacific*, Nancy Davis Lewis, associate dean of the College of Social Sciences at the University of Hawaii at Manoa, profiled some of these trends. For instance, on the atoll island of Nauru, the population of 5,000 experienced a significant lifestyle change including a move toward high-fat diets and more sedentary lifestyles following the 1906 establishment of phosphate mining, which eventually replaced their customary subsistence fishing and farming as the principal means of making a living. Currently, 32% of islanders 20 years and older have Type II diabetes, and Nauru has one of the highest adult mortality rates in the Pacific.

"There's evidence to suggest that the bodies of islanders are adapted to long-distance voyaging, and this may be the reason they take so poorly to Western diets and activity patterns," says Davis Lewis. The intermittent and sometimes lengthy periods of decreased food availability on such voyages may have created evolutionary pressure to select for people with the ability to store fat and easily maintain high blood sugar levels. With the increased and constant availability of food that accompanies Western culture and economies, this fat-storing physiology may put island people at increased risk of diabetes. "There's been significant westernization in the



**The western way.** Western development and the social and economic changes that accompany it may adversely affect Pacific Islanders' health.

Pacific, and we can say that it's bad," says Davis Lewis. "But we can't tell people to 'stay on the farm.' That's a pretty unreasonable stance to take."

Cigarette smoking is another Western addiction that appears to have taken hold in the Pacific Islands. Although recent data are scarce, information from the WHO regional office for the Western Pacific indicates that over 50% of men smoke in many Pacific Island territories and states, including American Samoa, Samoa, Tonga, Vanuatu, and Fiji. More than 80% of males in Kiribati smoke. Most islands observe the WHO-sponsored World No-Tobacco Day, but other than that, formal antismoking campaigns are rare.

These isolated islands support what were once some of the most fascinating and complex societies on the earth. The fact that they are inhabited at all, separated from mainlands by thousands of miles, is astonishing enough; that they have managed to thrive in the desert sea is a testament to the durability of human spirit and inventiveness. Ironically, the hardest test for these island societies may be their ability to cope with the "beneficial" influence of friendly Western nations. "It's easy to think of it as a 'Pacific paradise,'" says Davis Lewis, "and it's still a fantastic part of the world. But it's a changing world, and we just can't look at it in that romantic way anymore. The Pacific Islands are connected to the rest of the world now, and all of us are going to have to learn to deal with that."

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